

ADDITION TO THE SPECIES OF *DICTYOPTERIS* LAMOUREUX (*DICTYOTALES*) FROM KARACHI COAST

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Abstract

Taxonomy and morpho-anatomical notes of 3 new records of the genus *Dictyopteris* Lamouroux from the coast of Karachi Pakistan is presented.

Introduction

The coast of Karachi, Pakistan, has a rich marine flora mainly dominated by members of Phaeophyceae of the order Dictyotales. Of these *Dictyopteris* Lamouroux is found in tropical and sub-tropical seas (Nizamuddin & Saifullah, 1967) but recently Womersley (1987) reported its widespread occurrence in tropical and temperate waters. Most of the species of the genus are inhabitant of deeper waters and therefore not exposed at the time of low tide but due to high tides become detached and are cast upon the shore which can be collected as drift at the time of low tide. It also commonly grows in sandy bottom pools and on rocks at lower water mark.

Nizamuddin & Saifullah (1967) have reported 5 species viz., *D. acrostichoides* (J.Ag.) Boergesen, *D. australis* Sounder in Askenasy f. *karachiensis* Nizam. and Saif., *D. delicatula* Lamouroux, *D. divaricata* (Okam.) Okamura and *D. repens* (Okam.) Boergesen from the coast of Karachi. The present study reports 3 other species viz., *D. membranacea*, *D. polypodioides* and *D. tripolitana* for the first time from Karachi coast.

Materials and Methods

All the specimens were collected during 1982-89 from different localities of Karachi coast viz., Buleji, Hawkes Bay, Manora and Paradise Point in drift at the time of low tide. Specimens were mounted on herbarium sheets and also fixed in 4% formalin-seawater. Temporary and semi-permanent slides of preserved material were made by using glycerin and Kaiser's glycerin-gelatin (Johansen, 1940).

Identification of specimens is based on morpho-anatomical observations of 5-25 plants from each collection where 5-15 sections were cut from different parts of the plant and 5-15 cells were measured from each section. All diagrams were made with Camera lucida. The specimens are deposited in the herbarium of Phycology section in the Department of Botany, University of Karachi, Karachi, Pakistan.

Key to the Species

1. Segment thick with sori arranged linearly *D. polypodioides* Segment thin with sori arranged otherwise ----- 2
2. Sori arranged in transversely oblique rows on either side of the midrib -----
----- *D. tripolitana*
- Sori scattered on either side of the midrib ----- *D. membranacea*

DESCRIPTION OF THE TAXA

Dictyopteris polypodioides (De Candolle) Lamouroux 1809: 131 (Fig.1 & 2).

Syn. *Haliseris polypodioides* (Lamx.) C. Agardh 1823: 142; 1824: 262. Greville 1830: 64

Trevisan 1849:456. Durairatnam 1961:35. Nizamuddin 1981: 21.

Plant upto 20 cm in length; lower to middle part of the thallus thick and blackish brown; upper part thin and greenish brown; discoid rhizoidal holdfast; lower part of the thallus is stipe-like; midrib 0.5-1 mm broad at the upper part, 1-1.5 mm at the

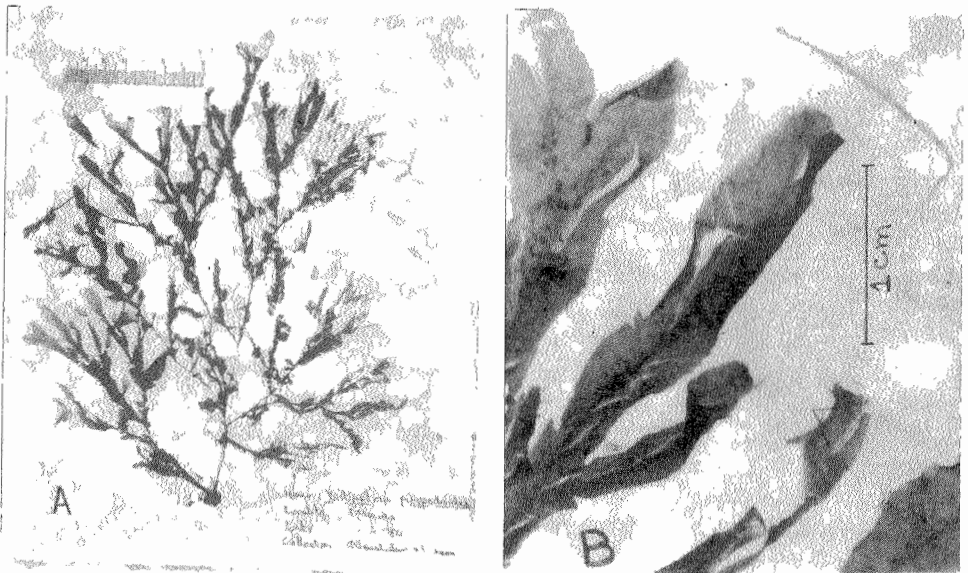


Fig.1. *Dictyopteris polypodioides* (De Candolle) Lamouroux: A. Plant with stipe and holdfast; B. Segments showing linear arrangement of the sori on either side of the midrib.

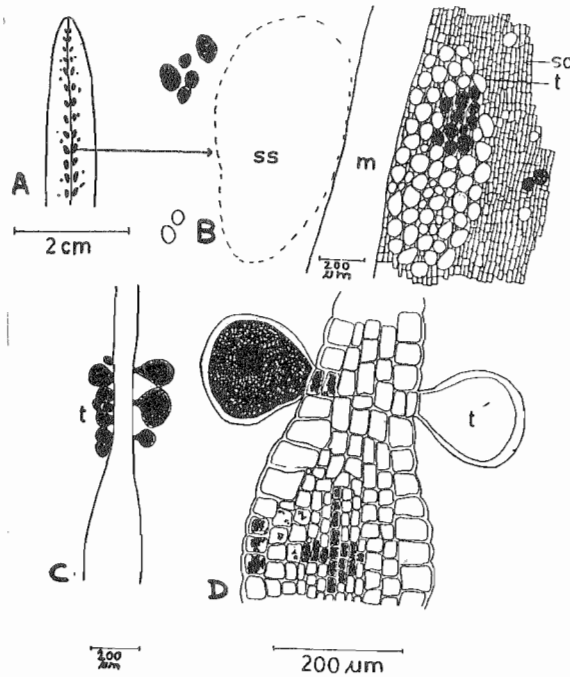


Fig.2. *Dictyopteris polyodioides* (De Candolle) Lamouroux: A. Arrangement of the tetrasporangial sori; B. Surface view showing sporangial sori; C. T.S. of the thallus showing grouped tetrasporangia; D. T.S. of the thallus showing origin of tetrasporangia.

Legend: as, antheridial sori; c, cavity; cr, central region; h, hairs; i, inducium; m, midrib; mr, marginal region; sc, surface cell; ss, sporangial sori; t, tetrasporangia.

lower part of the thallus; plant alternately, sub-dichotomously branched; segments thick, leafy and mostly linear and same in width throughout the thallus, 1.5 cm broad; apex bifid, narrowly round; sinuses broadly acute; surface smooth; margin entire, wavy or lacerated; surface cells 46 μm high, 23 μm broad.

Sori prominent, black in colour, large, oval in shape, arranged in 1-(-2) longitudinal row on either side of the midrib at the upper to middle part of the thallus and mostly scattered at the lower part of the thallus, found mostly on upper surface of the thallus or on the same place at lower surface of the thallus.

In T.S. upper part of the thallus 126 μm thick at the centre; 35 μm thick at the margin; midrib cells 12 μm high, 18 μm broad; surrounded by 1-2 layers of parenchymatous cells, 25 μm in diameter; assimilatory cells 25 μm high, 18 μm broad, mostly filled with chromatophores. Middle part of the thallus 250 μm thick; marginal part 60 μm thick; midrib cells 18 μm high, 25 μm broad; parenchymatous cells 35 μm in diameter; assimilatory cells 44 μm high, 28 μm broad, with dense chromatophores at the upper half part of the cells. Lower part 886 μm thick; midrib cells 18 μm high, 28 μm broad; parenchymatous cells 45 μm high, 40 μm broad; assimilatory cells 45 μm high, 30 μm broad.

Tetrasporangia black in colour, round in shape in surface view. In T.S. tetrasporangia round to spherical in shape, 120 μm high, 128 μm broad, mostly in pairs or in group of 2-3.

Local distribution: Manora (Leg. M. Begum & N. Khatoon, 7.4. 1984).

Geographical distribution: Arabian Sea: Ceylon, West coast of India and Pakistan. Atlantic Ocean: England, Portugal, Canary Island. Mediterranean Sea: Mallorca, France, Italy, Sicily, Libya, Tunisia. Southern Ocean. Karachi (Pakistan).

Pakistani specimens closely resemble Indian (Misra, 1966) and Libyan specimens (Nizamuddin, 1981) in their diagnostic features but differ from the Indian specimens in the presence of narrowly round apices and alternate and sub-dichotomous branching. It differs from the Libyan specimen in unflexuous thallus and narrowly rounded apices.

Dictyopteris tripolitana Nizamuddin 1981: 18 (Fig.3 & 4).

Plant upto 12 cm in height, greenish to yellowish brown; lower part stipe-like; plant dichotomously or sub-dichotomously branched; segment thin, membranous and same in width, 1-2 cm broad; apex bifid, acute; sinuses broadly obtuse; proliferations arise from midrib and membranous part of the thallus; surface smooth; margin entire and wavy; surface cells 45 μm high, 30 μm broad.

Sori yellowish brown, small, minute and round in shape, arranged in transversely oblique rows scattered on both surfaces at the middle to upper part of the thallus.

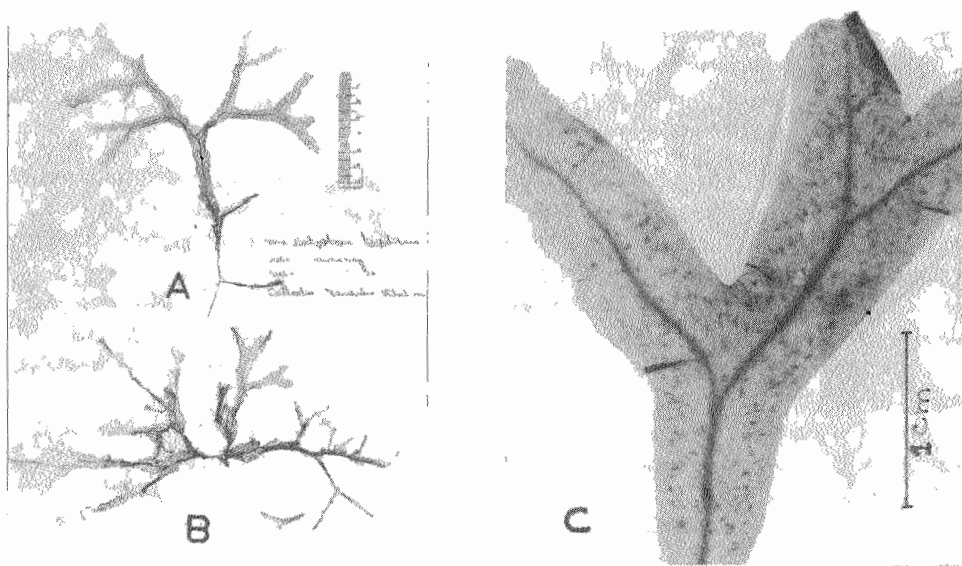


Fig.3. *Dictyopteris tripolitana* Nizamuddin: A. Plant with stipe and dichotomous branching; B. Plant showing dichotomous and sub-dichotomous branching; C. Segments showing transversely oblique arrangement of the sori.

In T. S. upper part of the thallus 124 μm thick at the centre; 42 μm thick at the margin; midrib cells 16 μm high, 22 μm broad; parenchymatous cells 30 μm high, 20 μm broad; assimilatory cells 25 μm high, 18 μm broad. Middle part of the thallus 235 μm thick at the centre; marginal part 83 μm thick; midrib cells 23 μm high, 32 μm broad; parenchymatous cells 41 μm high, 31 μm broad; assimilatory cells 33 μm high, 24 μm broad. Lower part 852 μm thick; midrib cells 36 μm high, 28 μm broad; parenchymatous cells 42 μm high, 34 μm broad; assimilatory cells 35 μm high, 26 μm broad, with dense chromatophores and thick cell wall.

Tetrasporangia reddish or blackish brown, round in shape, mostly single; hair cavities scattered and present in surface view. In T. S. tetrasporangia round to spherical, 100 μm high, 126 μm broad, intermixed with hairs, hairs 16 μm in width.

Local distribution: Manora (Leg. M. Begum & N. Khatoon, 11-2-1984; 7.4.1984. B.Motiwalla, 26.1.1986. M. Begum & Khatoon, 10.12.1989). Hawkes Bay (Leg.M. Begum & N. Khatoon, 31.3.1982).

Geographical distribution: Mediterranean Sea: Mallorca-Magaluf, Ceretes Italy-Barcola, Sicily-Arenella, Yugoslavia- Ragusa, Greece, Libya-Tripoli, Tunisia, Algeria. Atlantic Ocean: England-Sadrame bay. Karachi (Pakistan).

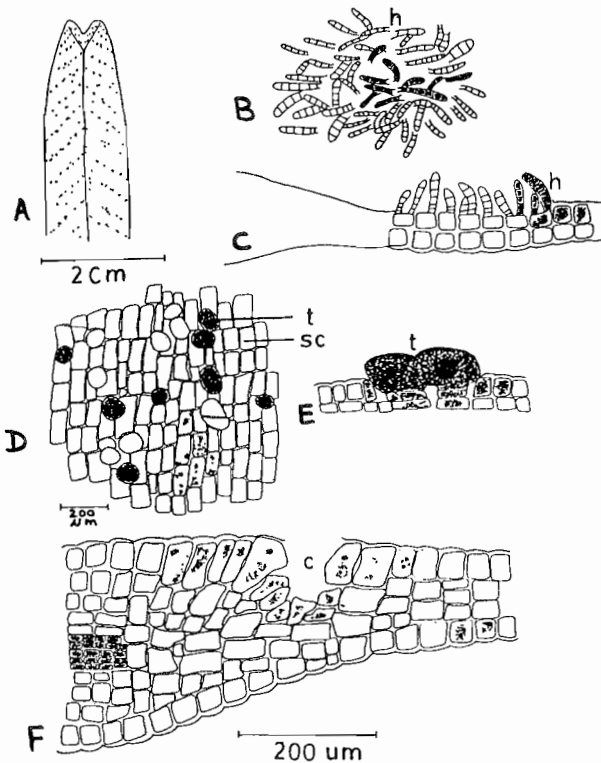


Fig.4. *Dictyopteris tripolitana* Nizamuddin: A. Arrangement of the sori; B. Hairs in surface view; C. T.S. of the thallus with hairs; D. Surface view with surface cells and tetrasporangia; E. T.S. through tetrasporangial sori; F. T.S. of the thallus showing empty cavity.

This species also resembles with *D. australis* f. *karachiensis*, in the arrangement of the sori but differs in thin texture of the segment and sori being small, minute and not regularly arranged.

Pakistani specimens resemble with the type photograph and description, in thallus form, shape and arrangement of the sori, branching of the segment, acute apices, wavy and entire margin thallus thickness and in number of layers but differ in smaller size plants (12 cm), segment same in width (1-2 cm) and broadly obtuse sinuses.

Dictyopteris membranacea (Stackhous) Batters 1902: 54 (Fig. 5 & 6)

Syn. *Zonaria polypodioides* (Lamx.) C. Agardh 1817: xxi. Durairatnam 1961: 35. *Haliseris polypodioides* (Desfont.) C. Agardh 1821: 142; 1824: 262. Greville 1830:64. J. Agardh 1848: 117. Kuetzing 1859: P1. 53, f.1. *Dictyopteris polypodioides* (Desfont.) Lamouroux. Trevisan 1849: 456.

Newton 1931: 216. Taylor 1960: 227. Misra 1966: 152. Nizamuddin and Lehnberg 1970: 112. Nizamuddin 1981: 16.

Plant upto 25 cm long, greenish to yellowish in colour; midrib 1 mm broad at the lower part, 0.7 mm at the upper part of the thallus; lower part of the thallus stipe-like; plant dichotomously or sub-dichotomously branched; segments thin, leafy and more or less same throughout the thallus, 1 cm in width; apex bifid, broadly acute; sinuses broadly obtuse; surface smooth; margin entire or wavy; surface cells 44 μ m high, 38 μ m broad. Reproductive organs scattered on both surfaces from upper to lower part of the thallus.

In T.S. upper part of the segment 120 μ m thick at the centre, marginal part 45 μ m thick; midrib cells 18 μ m high, 25 μ m broad; parenchymatous cells 25 μ m high, 20 μ m broad; assimilatory cells 22 μ m high, 18 μ m broad. Middle part of the thallus 238 μ m thick at the centre; marginal part 84 μ m thick; midrib cells 22 μ m high, 35 μ m broad; parenchymatous cells 38 μ m high, 31 μ m broad; assimilatory cells 32 μ m high, 23 μ m broad. Lower part 840 μ m thick at the centre; midrib cells 32 μ m high, 28 μ m broad; parenchymatous cells 43 μ m high, 32 μ m broad; assimilatory cells 32 μ m high, 25 μ m broad. Hair cavities scattered on both surfaces, hairs 16 μ m in width.



Fig.5. *Dictyopteris membranacea* (Stackhouse) Batters: A. Plant with stipe and holdfast; B. Segments showing scattered sporangial sori.

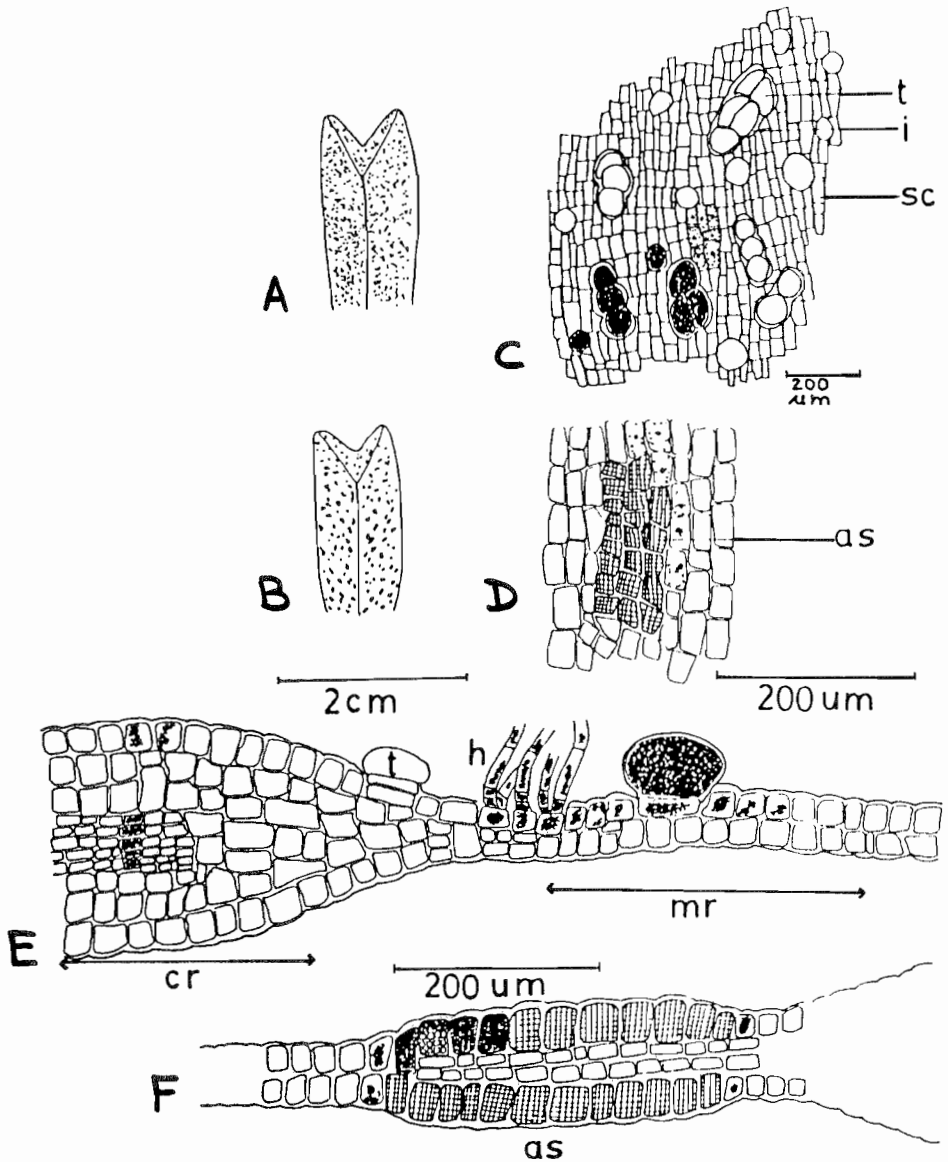


Fig.6. *Dictyopteris membranacea* (Stackhouse) Batters: A. Part of the segment with scattered tetrasporangial sori; B. Segment showing arrangement of antheridial sori; C. Surface view showing surface cells, tetrasporangia single, grouped and induciate; D. Antheridial sori in surface view; E. T.S. of the thallus showing origin of tetrasporangia and hairs; F.T.S. of the antheridial sori.

Tetrasporangia round to oval, reddish to blackish brown in colour, mostly single or in group of 2-6, induciate in surface view. In T.S. round to spherical in shape, 65 um in width.

Antheridial sori prominent yellowish to reddish brown, irregular in shape, occurs on both surfaces at the same place. In T.S. antheridia broadly elongate, 45 um high, 28 um broad, 4-5 celled in width, upto 20 antheridia in one sori, induciate. Oogonial sori not observed.

Local distribution: Manora (Leg. M. Begum & N. Khatoon, 31-3-1982). Paradise Point (Leg. M. Begum & N. Khatoon, 9.4.1982).

Geographical distribution: Atlantic Ocean : Sid Mouth Devon west Promontory. Mediterranean Sea: African as well as European Coast. Karachi (Pakistan).

Pakistani specimens resemble specimens from Britain (Newton 1931), Paros and Greece (Nizamuddin & Lehnberg 1970) and from Libya (Nizamuddin, 1981), in the characteristic arrangement of the sori and other morphological characters but differ with the Indian specimens (Misra, 1966) in the presence of dichotomous branching at the upper part of the thallus, segment leaf-shaped and tetrasporangial sori scattered on both surfaces of the thallus.

Pakistani specimens differ from the Libyan specimens in the absence of linear arrangement of sori near the apices (in other part sori scattered) and lateral or alternate branching at the lower part of the thallus.

D. membranacea resembles *D. tripolitana* in texture but differs due to the presence of scattered sori rather than transversely oblique row of sori. Nizamuddin (1981) reported that Libyan specimens of *D. membranacea* also resemble to *D. poly-podioides* in general habit but the latter differs due to flexuous frond and linear arrangement of the sori along either side of the midrib. He further suggested that due to polymorphic nature of *D. membranacea* it can be subdivided into different forms and varieties on the basis of constant characters, but the Pakistani specimens of *D. membranacea* has no resemblance to *D. poly-podioides* in general habit or in any other characters.

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